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## The Effect of Nutrition Education on Nutritional Behavior, Academic and Sports Achievement and Attitudes

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### Abstract

A vast number of researchers have investigated the impact of nutrition education on children's behavior and attitudes. In most of the studies, it has been revealed that health and balanced nutrition education has a positive effect on students' nutritional habits, body structure and academic achievement. The aim of this study is to determine whether the nutrition education program has an effect on students' nutritional attitudes and behaviors, sports attitudes and performance, and academic achievement. For this purpose, an experimental research design with pretest-posttest control group was used. A total of 60 students in the experimental and control groups participated in the research in Kazakhstan. The data of the study were collected with the 'Nutritional Behavior Scale', 'Attitude towards Nutrition Scale', 'Sport Performance Scale', 'Attitude towards Sports Scale' and 'General Academic Achievement Test'. According to the results of the study, the students who received the nutrition education program achieved positive nutrition attitudes and behaviors, higher sports performance and attitudes compared to the students in the control group who did not undergo any experimental procedure. However, no significant difference was found in the general academic achievement of the experimental and control groups.

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### Introduction

Children between the ages of 6 and 14 are defined as school age children. During this period, learning is rapid and children are extremely open to external influences. Habits begin to form during this period, in which it is possible for them to spend time in a healthy environment and adapt to an active life. Especially in this period when growth and development processes are fast, the nutritional habits they will gain will be an important set in front of the acquisition of excess weight that will occur for a lifetime and cardiovascular and other systemic diseases for which these weights will be responsible. In addition to the significant amount of energy that their bodies need during the growth process, adequate amounts of protein, minerals and vitamins are also required. In order to meet these needs in a balanced and adequate way, it has become necessary to develop special nutrition programs for children of this age and to make necessary arrangements for these programs in their environment (Dimbleby & Vincent, 2013;

The Joint Consortium for School Health, 2016). School children need adequate and balanced nutrition for the healthy development of their physical and mental structures. Since this age group, which is the core of the society, is the group most affected by nutritional deficiencies, their nutrition should be given great importance (USDA, 2005). Inadequate and unbalanced nutrition is among the most important health problems of developing countries. Although the problem is encountered in all age groups, nutrition is of particular importance, especially in school-age children. Since children in this age group are in constant biological change, they need more energy and other nutrients. More and better quality protein, vitamins and minerals are required for the construction of new tissues (Food and Nutrition Board, Institute of Medicine, National Academies, 2005). Childhood is a period in which long-lasting habits are established. Changes in lifestyle to ensure proper nutrition do not lead to negative changes in quality of life, and fasting habits are among these habits (Belmaker & Cohen, 1985; Hellenius et al., 1995).

Thanks to adequate and balanced nutrition, the expected growth and development of children according to their age is ensured, and their resistance to diseases increases. In addition, the importance of eating habits gained in childhood is emphasized in bone development, increase in cognitive ability and school performance, and in the prevention of some diseases seen in later ages. The school environment is of great importance in reinforcing the healthy eating habits acquired in childhood. One of the important reasons underlying the healthy diet of students in school nutrition may be that students come to school ready to learn and gain healthy eating habits in their later lives. Health education given at school can play an active role in acquiring healthy eating habits throughout life (Follong et al., 2020; Hurley, Yousafzai & Lopez-Boo, 2016; Mahumud et al., 2022; Sahota et al., 2001).

It is of great significance to provide energy intake balance and optimum nutrition in childhood. A healthy diet has been linked to academic achievement, physical performance, and improved cognitive and psychomotor level for both children and adults (Akdeniz et al., 2016; David et al., 1984; Pollitt & Lewis, 1980; De Groot et al., 2012; Vassiloudis, Yiannakouris, Panagiotakos, Apostolopoulos and Costarelli, 2014). Since adolescence children are in the growth process, their nutritional requirements are different from adults. In this period, inadequate and unbalanced nutrition negatively affects both the physical development and learning ability of the child. In order for school-age children to be successful in the education process, healthy conditions must be provided (Contento, 2007). In this context, people who influence, direct and train human health should have sufficient nutritional knowledge. In particular, teachers' nutritional knowledge should be sufficient and they should transfer this knowledge to students in order for students to gain proper nutrition habits. Nutrition education is a very difficult process, contrary to what many people think. Because it is not easy to change people's eating habits. In order to persuade individuals to develop better eating habits, it is necessary to first understand why they are fed this way. Generally, financial situation, price of food, availability, beliefs and habits are factors that affect the eating habits of individuals. In particular, the low socioeconomic status of families negatively affects the food consumption habits and frequency of family members and causes the inability to meet their healthy nutritional needs (Abdullah, 2021; Martin et al., 2021; Onuralp, 2021; Santoso et al., 2019; Vaughn, 2021; Zheng & Ju, 2021).

It is generally stated that eating habits and food choices are established in childhood or adolescence and this pattern may continue in adulthood (Mikkila et al., 2005; Stonge, Keller & Heymsfield, 2003). For this reason, it is very important for individuals to have the right eating habits and to eat healthy. However, studies have shown

that adolescents, who are among the nutritionally sensitive and risky groups, have irregular diet patterns and skip meals (Hackett et al., 2002; Savige et al., 2007). Children and adolescents have the right eating habits, adequate and balanced nutrition is one of the elements that form the basis of a healthy society. In this context, it is essential to determine the nutritional habits and nutritional status of individuals at the beginning of the work, in terms of taking the necessary precautions. For this reason, providing nutrition education in childhood is important in terms of gaining proper nutrition habits for young people. Because the habits gained in this period form the basis for adulthood (Contento, 2007; Mandos, Kafatos & Kafatos, 2006). The World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) state that the most common health problems in childhood and adolescence are; obesity, eating disorders, insufficient physical activity, depression, anemia, smoking and alcohol use (CDC 2017; WHO 2018). Today, children consume foods high in carbohydrates (such as french fries, juice, sweets and fried meat products) more often. In addition, eating out, excessive and irregular eating habits during and between meals, and the size of the portions are effective in the formation of unbalanced eating behaviors (Glover et al. 2011; Kraak, Liverman & Koplan, 2005).

The most important reason for inadequate and unbalanced nutrition after economic reasons is the lack of nutritional information. Nutritional knowledge level is one of the factors that affect the nutritional habits, food choices and nutritional status of individuals, families and societies. Education of the society and individuals about nutrition by nutritionists positively affects the quality of life and health status of the society. Nutrition education has a great place and importance to protect and improve health (Campbell, Abbott & Spence, 2013; Hindin, Contento & Gussow, 2004). These problems, which occur as a result of lack or excessive consumption of nutrients in the diet, increase the risk of chronic diseases that may develop later. For this reason, it is of great importance to make the necessary recommendations for the intake of nutrients in a balanced and sufficient way and to ensure healthy growth (Lua & Wan Putri, 2012).

Adequate, balanced and varied nutrition is the intake of the nutrients the body needs in the right amount at the right time. Malnutrition causes physical development and mental disorders. Diseases caused by deficiencies of nutrients occur. In addition, inadequate and unbalanced nutrition weakens the immune system and causes many diseases to occur and progress severely (Worsley, 2002). The energy and nutrient needs of school-age children are different and variable than adults. School-age children get their energy from food and use this energy for growth and development, metabolic functions (such as respiratory, digestive, circulatory systems), physical activity. There are factors that affect the amount of energy required for school-age children, such as age, gender, weight, height, and physical activity status (Pipes, 1995). In order for the energy, vitamins, minerals, complex carbohydrates and protein taken from the foods consumed daily to be used correctly, foods consisting of all nutrients should be taken regularly and in a balanced way during the day.

In addition to the positive effects on growth, development and learning, the nutrition programs given in schools will also reduce the risk of chronic diseases such as obesity, coronary heart disease, diabetes and cancer in adulthood. Growth and development, which is the best indicator of nutrition, can be determined by height and weight measurements and food consumption investigations in children (Abood, Black & Birnbaum, 2007). School-based dietary and physical activity changes reduce the risk of obesity and chronic disease and health

expenditures. Schools are the ideal places to evaluate the nutritional status of children and adolescents and to provide nutrition education. Since this age group spends most of their time at school and consumes at least one meal at school, they can gain practical eating habits at school. The fact that parents work in the family, they cannot spare much time for their children, and the increase in children's eating habits outside the home prevent parents from monitoring their children's eating habits. For these reasons, it is very important to implement programs such as nutrition education, breakfast and lunch given under the supervision of nutritionists in schools. While participating in physical classes at school increases the level of physical activity, it can also teach the benefits of sports, make sports popular, and gain a lifelong habit of doing sports (Vince-Whitman et al., 2000; Wang, Gutin & Barbeau, 2008).

Studies on the effects and relationships of children's nutritional status and physical activity on their development have shown that there may be differences depending on factors such as family, culture and environment, and that changes in education levels may also affect their level of nutrition knowledge. Children, young people in the age of growth and development, and athletes are among the groups affected by unbalanced nutrition. In this respect, it can be mentioned that there is a close relationship between nutrition and sports performance and activities. Regular sports and physical activity provide a healthy bone structure, a strong muscle system, control and prevention of obesity, reduction of fat ratio, and effective development of the heart and lungs in children (Lee et al., 2007; Mokdad et al., 2003). Most sports experts agree that a balanced diet is necessary to achieve good performance (Hawley, Burke & Phillips, 2010; Rossi et al., 2017). Adequate and balanced intake of nutrients is necessary for optimal performance by making arrangements for training and competition periods according to the athlete's gender, age, daily physical activity and type of sport. When planning athlete nutrition, the athlete's age, gender, height, weight, body composition, nutritional habits and possibilities, health status, social and economic conditions should also be taken into account (Brotherhood, 1984; Maughan & Shirreffs, 2012). While adequate and balanced nutrition improves performance, inadequate and unbalanced nutrition affects performance negatively. Conscious nutrition is also important for sports activities. Because, an athlete who cannot have a balanced diet cannot find the strength to do sports activities, cannot stay in shape, cannot gather the necessary energy (Cholewa et al., 2015; Konopka, 2000). On the other hand, it is important to determine the health risks related to nutrition and sedentary behaviors of school-age children, to plan appropriate nutrition and sports activity trainings, and to develop children's positive health, nutrition and sportive behaviors. For this reason, in this study, nutrition education was attached importance so as to change the positive behavior of children in terms of adequate balanced nutrition and sportive activity.

Nutrition education programs are an effective method in helping children and adolescents gain healthy eating habits. Nutrition education should be given together with other courses at school, for example, children's daily energy and nutritional values should be calculated in math class, or texts related to nutrition should be selected in reading classes. Nutrition specialists should be invited to the school and meetings should be held on healthy eating. Nutrition Education Programs given in schools must also include teachers. The training provided has positively affected the health status and morale of teachers, which has increased the quality of education (Centers for Disease Control and Prevention, 1996; Weiss & Kien, 1987). In addition to providing nutrition education by using interactive education methods in order to change school-age children's nutrition, sportive activity behavior and

related academic achievement, it is especially important to support programs and factors that enable positive behavior that are effective in students' habits in this regard. For this reason, in this study, the effects of the nutrition education program applied to school-age children on their nutritional behaviors and attitudes, sports performance and attitudes and academic achievement were examined. Within the framework of this purpose, answers to the following questions were sought in the study.

1. To what extent does the nutrition education program for school-age children affect their nutritional behaviors and attitudes?
2. To what extent does the nutrition education program for school-age children affect their sports performance and attitudes?
3. To what extent does the nutrition education program for school-age children affect their general academic achievement?

## **Method**

### **Experimental Process**

Before the Conscious Awareness Family Education Program, which was developed for middle school students on balanced nutrition and sports, was prepared, a needs analysis study was conducted in order to ensure that the program was oriented to the needs of the participants. Participation in the study is completely voluntary. In this context, the children had their parents fill out the voluntary participation form for them. The criteria for participation in the Nutrition Education Program were that the children in the experimental group should be between the ages of 11-13, the student should not have any medical diagnosis, and the child and the parent should be willing to participate in the education and ensure regular participation. The Nutrition Education Program, which was developed within the scope of the study by conducting a needs analysis study, was applied once a week for a total of 8 weeks, for an average of 120 minutes. Before starting the applications of the program, pre-test applications were carried out for the children in the experimental and control groups. After the program was completed, post-tests were administered to the children in the experimental and control groups. After evaluating the data obtained from the Nutrition Education Needs Determination Form, the topics of the program were determined. In this direction, Nutrition Education Program; energy and nutrient requirements of school-age children, adequate and balanced nutrition, food hygiene, food safety, nutrition and physical activity, nutrition and disease prevention, school-age nutrition problems, growth-development and nutrition, nutrition and mental-cognitive development. The nutrition education program, which was prepared in line with the determined topics, was submitted to the opinion of five field experts and the program was finalized by taking into account the feedback from the experts.

*Practice of the Nutrition Education Program:* The Nutrition Education Program was carried out in the form of case studies, presentations and information sessions for two hours once a week for eight weeks. The trainings were given in the meeting room determined by the school administrators in the schools where the family education program will be implemented. In the trainings, methods and techniques such as narration, question-answer, case study, group discussion were used by using a projection device. At this stage, no education was given to the children in the control group. After the training program was completed, the posttests of the study were applied

to the students in the experimental and control groups.

After obtaining permission from the school administration to work, experimental applications of Municipal State Institution "Gymnasium School no. 14" of the Akimat of Nur-Sultan students were carried out. The acceptance of the product was approved by the students of the sports school and their parents. All ethical standards were complied with. While no intervention was made on the control groups in the teaching of the related nutrition education program behavior gains in the secondary school within the scope of the study, the 'Planned Nutrition Education Program' was applied in the experimental groups. Children attending middle and second grades of two selected groups, one experimental and one control group, were included in the study. The study group consisted of 60 students in total, 30 of whom were in the experimental group (15 girls, 15 boys), and 30 were in the control group (16 girls, 14 boys). The average age of the students is  $X=13.2$  years ( $\pm 0.18$ ) and the monthly income of their families is below \$600. In determining the classes that make up the study group; the proximity of socioeconomic levels, the similarity of school achievements and opportunities, easy transportation and time factors were taken into account. In the selection of classes in the school, teachers' opinions, class structure and student characteristics were taken into consideration. In line with these data, the existing natural classes were selected using the cluster sampling method without disturbing the structure of the classes. However, it was decided which group would be the experimental or control group by way of neutral assignment. In order to determine whether the entry behaviors of the groups differ in terms of Nutritional Behaviors and attitudes, sports performance and attitudes, and general academic achievement, the relevant scales were applied as a pre-test. The independent t-test results regarding the comparison of the pretest scores of the groups are given in Table 1.

Table 1. Comparison of Pre-Test Nutritional Behaviors and Attitudes of Experimental and Control Groups

Pre-test	Group	N	Mean	Std. Deviation	t	p
Attitude Towards	Experimental	30	3.22	0.36	.396	.694
Nutrition	Control	30	3.18	0.35		
Nutritional	Experimental	30	3.09	0.46	-.370	.713
Behavior	Control	30	3.12	0.31		

When Table 1 is examined, no statistically significant difference was found between the groups in terms of nutritional attitudes and behaviors as a result of the independent t-test for the pre-test nutritional attitude and behavior scores of the control and experimental groups [ $p>0.05$ ]. This finding shows that the control and experimental groups were close to each other in terms of nutritional attitudes and behaviors before the application.

Table 2. Comparison of Pre-Test Sports Performance and Attitudes of Experimental and Control Groups

Pre-Test	Group	N	Mean	Std. Deviation	t	p
Attitude	Experimental	30	3.28	0.92	.447	.657
Towards Sports	Control	30	3.18	0.79		
Sports	Experimental	30	2.21	0.46	.749	.457
Performance	Control	30	2.13	0.44		

When Table 2 is examined, no statistically significant difference was found between the groups in terms of sports attitude and performance as a result of the independent t-test for the pre-test sports attitude and performance scores of the control and experimental groups [ $p>0.05$ ]. This finding shows that the control and experimental groups were close to each other in terms of sports attitudes and performances before the application.

Table 3. Comparison of Pre-Test Academic Achievement of Experimental and Control Groups

Pre-test		N	Mean	Std. Deviation	t	p
Achievement	Experimental	30	27.25	8.10	.083	.935
	Control	30	27.03	12.35		

When Table 3 is examined, no statistically significant difference was found between the groups in terms of academic achievement as a result of the independent t-test for the pre-test scores of the control and experimental groups [ $t(60)=0.083$ ;  $p>0.05$ ]. This finding shows that the control and experimental groups were close to each other in terms of general academic achievement before the application.

### Data Collection Tools

Personal information form, nutritional behavior scale, attitude towards nutrition scale, sports performance scale, attitude towards sports scale and general academic achievement test were used as data collection tools in the study.

### *Performance Scale in Sports*

The scale is a scale developed by Hill, Appleton, and Mallinson (2016), inspired by Hewitt and Flett's (1991) model for the dimensions of perfectionism. The aim of the scale is to measure the perceptions of children and adults regarding sports performance. A 5-point Likert-type rating system was used in the grading of the 12-item scale: (1) strongly disagree (2) disagree, (3) partially disagree, (4) undecided, and (5) strongly agree. EFA (Exploratory Factor Analysis) was performed on the scale scores, and CFA (Confirmatory Factor Analysis) was performed to confirm the structure by determining which structure the scale was for our own culture. After the validity study, Cronbach's Alpha values and two-half test reliability (Split-Half) were calculated for the internal consistency reliability of the scale, and the Explained Mean Variance and Construct Reliability (CR) values were calculated for the convergent validity. As a result of the analyzes performed on the scale scores, the Cronbach Alpha coefficient was found to be .88. High scores on the scale indicate that the perception of sports performance is high.

### *Attitude Scale towards Sports*

In the study, the "Attitude Scale towards Sports" was used to measure the attitudes of the participants towards sports. "Attitude Scale Towards Sports" developed by Şentürk (2014) consists of 25 items. The scale measures affective characteristics such as interest in sports, living with sports and active sports. The Attitude towards Sports Scale is a 5-point Likert-type rating scale as "Totally Agree (5), Agree (4), Undecided (3), Disagree (2), Strongly



Disagree (1)". The minimum score that can be obtained from the scale is 25 and the maximum score is 125. The high score indicates the high attitude towards sports. Since the Cronbach-alpha internal consistency coefficient of the scale was calculated as 0.92 for this study, the reliability of the data is quite high.

### ***Nutritional Behavior Scale***

Children's food consumption was evaluated with the "Nutritional Behavior Scale" developed within the scope of food consumption. The scale consisted of 14 items with low-fat/salty and high-fat/salty food options to determine the food consumption of children. Children were shown comparable foods and asked which of the two foods they ate the most (frequently). Scale items are negative for unhealthy food and positive for healthy food. In the scale converted into a Likert form, negative scores were subtracted from positive scores, and nutritional behavior scores were obtained. A high total score from the scale indicates healthy eating habits. Low scores on the scale indicate unhealthy food consumption, while high scores indicate healthy food consumption. The internal consistency reliability coefficient of the original scale was found to be 0.76 (Parcel et al., 1995). For this tool, validity and reliability analyzes were conducted within the scope of the scale and Likert form adaptation study to Kazakh culture. The Cronbach Alpha internal consistency coefficient of the scale, which reveals the one-dimensional structure, was calculated as .79.

### ***Nutrition Attitude Scale***

The nutritional attitude scale was developed by the researcher to measure the child's attitude towards activities that reduce fat intake, increase healthy food consumption, and nutrition style that improves health. The scale in the Likert form takes values in the range of 1-5 (1- strongly disagree, 4- strongly agree), with a total score between 5-50. The total scores obtained from the scale are divided by the number of items and the average of the nutritional attitude score is obtained. A high mean score from the scale indicates a positive eating attitude. As a result of explanatory factor analysis, it was seen that the attitude scale towards nutrition had a one-dimensional structure. The explained variance of this one-dimensional structure is 62.26%. The internal consistency value calculated with the Cronbach Alpha reliability coefficient was found to be .86. These findings show that the attitude scale towards nutrition is valid and reliable for the participants in the sample of the study.

### ***General Academic Achievement Test***

General Academic Achievement Test, developed by the researcher, was prepared as a multiple-choice test, taking into account the achievements of the curriculum in which the participant students studied. In the study, questions were prepared considering the units within the scope of mathematics, language, social studies and science courses. In order to ensure content validity, the opinions of two subject area experts and an assessment-evaluation expert were also consulted, and expert opinion was taken to determine the appropriateness in terms of language. In the beginning, a multiple-choice test with 50 questions was created in accordance with the achievements and a pilot test was applied. In line with the item analysis after the pilot test application, it was decided to exclude the questions with a distinctiveness index below .30. Validity and reliability measurements were made for the

remaining 40 questions. In this study, the KR-20 formula, which is a special form of the Cronbach's Alpha coefficient, was used to calculate reliability (Sünbül, Gündüz & Yılmaz, 2002). As a result of the validity and reliability calculations, the reliability coefficient (KR-20) of the test was found to be 0.86. The lowest score that can be obtained from the test is 0, and the highest score is 40. The high score indicates the high level of general academic achievement.

### Data Analysis Techniques

Statistical analysis of the data was made with SPSS 23 program. Normal distribution of the data and homogeneity of variance, which are the prerequisites for using parametric tests, were tested. Levene test was used as variance homogeneity test. Parametric statistical tests were applied according to the normal distribution of the data. Independent Samples t-test was used to determine the difference between the pretest and posttest scores between the groups.

### Findings and Discussion

When Table 4 is examined, a statistically significant difference was found between the groups in terms of nutritional attitudes and behaviors as a result of the independent t-test for the post-test nutritional attitude and behavior scores of the control and experimental groups [ $p < 0.05$ ]. This finding led to a significant difference in the nutritional attitudes and behaviors of the experimental groups compared to the control group after the implementation of the nutrition education program. In this respect, the nutrition education program applied to school-aged children had a significant effect on their positive eating behaviors and attitudes.

Table 4. Comparison of Post-Test Nutritional Behaviors and Attitudes of Experimental and Control Groups

Post-test		N	Mean	Std. Deviation	t	p
Attitude Towards	Experimental	30	4.41	0.40	2.532	.014
Nutrition	Control	30	4.06	0.64		
Nutrition	Experimental	30	4.06	0.52	5.334	.000
Behavior	Control	30	3.35	0.51		

When Table 5 is examined, a statistically significant difference was found between the groups in terms of sports performance and attitudes as a result of the independent t-test for the post-test sports performance and attitude scores of the control and experimental groups [ $p < 0.05$ ]. This finding led to a significant difference in the sports performance and attitudes of the experimental group compared to the control group after the application of the nutrition education program. In this respect, the nutrition education program applied in the experimental group of school-age children had a significant effect on the sports performance and attitudes of the children. When Table 6 is examined, no statistically significant difference was found between the groups in terms of academic achievement as a result of the independent t-test for the post-test scores of the control and experimental groups [ $p > 0.05$ ]. This finding shows that there is no difference between the control and experimental groups in terms of general academic achievement after the application.

Table 5. Comparison of Post-Test Sports Performance and Attitudes of Experimental and Control Groups

Post-Test	Group	N	Mean	Std. Deviation	t	p
Attitude Towards Sports	Experimental	30	4.08	0.44	2.046	.045
	Control	30	3.80	0.59		
Sports Performance	Experimental	30	3.11	0.91	4.180	.000
	Control	30	2.32	0.50		

Table 6. Comparison of Post-test Academic Achievement of Experimental and Control Groups

Post-Test	Group	N	Mean	Std. Deviation	t	p
Academic Achievement	Experimental	30	29.50	7.32	.650	.518
	Control	30	27.91	11.05		

In this experimental study, the effect of the nutrition education program applied to school-age children in Kazakhstan on their Nutritional Behaviors and attitudes, sports performance and attitudes and academic achievement was investigated. As to the research findings, the students in the experimental group, who were given a nutrition education program, developed positive eating behaviors and attitudes compared to their peers in the control group, who did not receive any treatment. These findings include Contento (2008), Cooke and Wardle (2005), Egg et al. (2020), Lua & Wan Putri (2012), Pérez-Rodrigo & Aranceta (2003), Powers, Struempfer & Guarino (2005), Prelip et al. 2012), Sharma (2007), Silveira, Taddei & Gueraa (2011), Story, Lytle & Birnbaum (2002), Watts et al. (2012). According to Egg et al. (2020), nutrition education programs applied to both students and their teachers increase the target groups' knowledge of healthy and balanced nutrition, and in this case, indirectly contribute to the development of positive nutritional attitudes and behaviors in children. According to Cooke and Wardle (2005), children's food preferences/consumption change during primary and secondary school years, especially during transition periods. Nutrition education programs to be applied to children at this age increase their awareness of eating independently outside the home and their autonomy about food, and in this case, enable them to make positive food choices. An important variable that affects children's eating behaviors is "nutrition attitude". The fact that attitude is the determinant of healthy food consumption can be associated with consuming more healthy food. The nutrition education program implemented in this study led to significant increases in children's perceptions and attitudes towards nutrition. Food preferences (attitudes) can be considered as wanting a food, liking it, preferring one food over another (Vereecken et al., 2005). According to Bere and Klepp (2004), nutrition education programs positively affect children's nutritional attitudes (preferences), healthy food preferences (fruits and vegetables), food liking and taste preferences. Results of a study of dietary habits showed that nutritional education and additional health practices were significantly beneficial in improving body composition, dietary habits, daily nutrient intake, and quality of life (You, Sung & Chang, 2009).

Sports performance and attitudes towards sports are another dependent variable discussed in this study regarding the effects of the nutrition education program. In the study, significant increases were observed in the sports performance and attitudes of the experimental group students who were applied nutrition education program compared to the control group students at the end of the experimental procedures. In the experimental group, the theme of health, nutrition and sports was covered as a module of the nutrition education program. These results

of the study are Durkalec-Michalski et al. (2018), Grosso et al. (2013), Hagarty et al. (2004), Kerksick et al. (2018), Kondo et al. (2018), Murimi et al. (2017), Philippou et al. (2017) are similar to the findings of the studies conducted by Sánchez-Díaz et al. (2020). According to Grosso et al. (2013), there is a relationship between a high level of nutritional knowledge and an increase in physical activity. When health and balanced nutrition education programs are associated with other life skills and activities, participants tend to engage in physical activity at a higher rate and their motivation for sports increases. Sports have a great importance in raising children in a healthy and healthy way in all aspects. Because sports affect not only physical health but also mental and social health. Sport is also useful in preventing bad habits, as it is a way to spend free time. The energy and other nutritional requirements of children who do sports are higher than those who do not do sports at that age. For this reason, effective nutrition education programs should also include the relationship between sports and nutrition. In the experimental applications of this study, both theoretical and practical activities related to sports nutrition relationship were included. These practices reflected positively on children's sports performances and attitudes.

Another dependent variable discussed in this study regarding the effects of the nutrition education program is general academic achievement. In the study, no significant differences were observed in terms of general academic achievement at the end of the experimental procedures between the students in the experimental group and the students in the control group, to whom the nutrition education program was applied. In the literature, the number of studies on the relationship between balanced and adequate nutrition and academic achievement in individuals is very few. However, there is evidence that a healthy and balanced diet improves children's academic achievement. For example, in a study conducted by De Groot et al. (2012) to examine the cognitive level and school performance of 700 college students in the Netherlands, they revealed that proper nutrition is associated with high vocabulary and high end-of-term grades. Again, many studies have reported that unbalanced nutrition and iron deficiency reduce mental functions and school success in school children (David et al., 1984; Pollitt & Lewis, 1980). In this study, the lack of significant differences in academic achievement between the group that received nutrition education and the group that did not may be related to the shortness of the nutrition education program. For this reason, long-term longitudinal studies are recommended on the reflection of nutrition and nutrition education on academic achievement. In the literature, nutrition at school age is closely related to learning as well as growth and development. Well-nourished children have higher school success than those who are malnourished and unbalanced. It has been reported that as the quality and number of school health programs increase, children's cognitive development and academic achievement increase (Sandstead et al. 1998). Success in learning and education in children depends on good nutrition and being healthy. According to Krebs (2010), as a result of inadequate intake of certain nutrients and problems related to nutritional deficiencies in the child's nutrition, health is affected, learning difficulties occur and school success decreases. In this respect, it is recommended that future studies focus on mixed-model studies on healthy nutrition and academic achievement in school children.

## **Conclusion**

This study examined the relationship between nutrition education programs applied to students and students' Nutritional Behavior-attitude, sports performance-attitude and academic achievement. Based on the results of this

study, attention should be paid to the adequate and balanced nutrition of students during the day, and the decisive effect of nutrition on behavior, sports performance and academic achievement should be emphasized. By providing various opportunities by the relevant ministries and school administrations, interventions should be made to develop healthy eating behaviors for students in educational institutions. Researchers can investigate the reasons for the results in more depth with qualitative and mixed model studies. The fact that this research was conducted with students in a certain age group in Kazakhstan creates a limitation in generalizing the findings to all children and adolescents. Researchers can examine variables that may be associated with nutritional behavior, sports performance, attitudes, and success in various educational levels and other regions.

## Note

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